

## HIGH PERFORMANCE COMPUTING SPECIALIST - FLUID MECHANICS ENGINEER

### Competences and skills

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- Knowledge of high performance computational science on the Computational Fluid Dynamics (CFD) field.
- Code portability on different architectures, parallelism and partitioning strategies, use of versioning tools, scalability, profiling and debugging analysis.
- Considerable communications and collaborative skills, including the ability to work well with other laboratories, universities, supercomputer centers, and industry.
- Development, maintenance and utilisation of high-performance massively parallel unstructured CFD tools for industrial applications: unsteady aerodynamics of compressible flows, combustion, Lagrangian particle tracking.
- Modelling of two-phase flows using unsteady CFD approaches (DNS and LES).
- Management of software development projects and creation of websites.

### Work experience

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#### **Assistant Computational Scientist, Argonne National Laboratory, Argonne, USA      October 2010 – present**

- Assistance with algorithm development, scaling efforts and collaboration with Leadership Science Project Teams to enable breakthrough science and engineering research at the Argonne Leadership Computing Facility (ALCF).
- Part of the support team that monitors project progress and helps forestall problems with using ALCF.
- A single point of contact for key research initiatives and full project lifecycle assistance.
- Reports on the way that ALCF resources have been used, preparing reports and giving presentations at internal meetings and user meetings. Participates in division activities including contributing material for proposals.
- Builds relationships with other supercomputer centers to address common challenges on computational science issues.

#### **Postdoctoral fellow, CERFACS, Toulouse, France      February 2009 – September 2010**

- Analysis of dynamic load balancing and implementation of parallel partitioning algorithms (from ParMETIS library) for unstructured 3D CFD codes.
- Code and users support of the Lagrangian module developed during the Ph.D.

#### **Ph.D. Student, CERFACS, Toulouse, France      October 2005 – January 2009**

- Thesis funded by SNECMA and CERFACS.
- Responsible for conception, development and implementation of a Lagrangian particle tracking method in a parallel and unstructured CFD code.
- Maintenance and management of new developments; training and support of other students involved in the project.
- Redaction of technical reports and code documentation. Technical presentations to international audience. Collaboration with national entities IFP, TURBOMECA and ONERA.
- Participation to the Center for Turbulence Research Summer Program 2006 at Stanford University.

#### **Study engineer, CERFACS, Toulouse, France      Mars 2002 – August 2005**

- Implementation of partitioning algorithms (from METIS library) for CFD computations.
- Support to parallelism development, code debugging, profiling and memory optimisation of a CFD unstructured code.
- Redaction of technical reports and code documentation of partitioning and parallel library.

#### **Project manager, INGEMETAL S.A., Zaragoza, Spain      May – September 2001**

- Construction of the *Burke Brise Soleil* cover for the Milwaukee Art Museum addition (designed by Santiago Calatrava).
- Responsible for communication, work supervision and interactions between American and Spanish working teams.

#### **Internship – Instituto Tecnológico de Aragón, Zaragoza, Spain      July 2000 – May 2001**

- Acoustic measurements and viability studies at the Mechanical and New Materials Dept.

## Education

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**Ph.D. in Fluid Mechanics** *delivered by INPT, CERFACS, Toulouse, France*

**19 January 2009**

«Development and validation of the Euler-Lagrange formulation on a parallel and unstructured solver for large-eddy simulation» - Advisor: **T. Poinso**t.

**Degree in Mechanical Engineering**, *Centro Politécnico Superior, Zaragoza, Spain*

**21 February 2001**

*Final project:* «Numerical simulation of the effects of components deterioration in gas turbine systems». Carried out at the Aerospace and Mechanical Engineering Dept., University of Rome 'La Sapienza' (Italy) with a **Socrates/Erasmus** Grant.

*Major:* Energy and Technology of Heat and Fluids.

*Relevant courses:* Fluid Dynamics, Mechanics, Thermodynamics, Mathematical Analysis, Machines, Propulsion systems, Numerical methods, Structures, Elasticity, Automatic and Electronic systems, Circuits, Chemistry, Economy, Materials, Statistical Methods, Industrial Design and Organisation, Norms and Quality, Environment, Renewable Energies.

Equivalent to a French **BAC+5**.

## Awards

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- Label C3I - Certificat de Compétences en Calcul Intensif - (see list on: <http://www.genci.fr/spip.php?article71>), 2009.

## Languages

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- Spanish: mother tongue.
- English and French: written, read and spoken fluently. Daily use in the research framework.
- Italian: read and spoken fluently; good written.

## Computer skills

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- Programming languages: Fortran 77 and 90; notions in C/C++.
- Parallel programming tools and languages: MPI; notions in OpenMP.
- Debugging and profiling tools: Totalview, DDT, gdb, gprof, ssrun, Scalasca, HPCToolKit.
- System: Unix, Linux, Mac OS X, Windows.
- Visual software: Tecplot, Ensign, Fieldview, Paraview, VisIt.
- Computing software packages and libraries: METIS, ParMETIS, LAPACK, BLAS.
- Internet: HTML, PHP, CSS and SPIP; notions in Javascript and XML (creation and maintenance of several websites: 3 European projects, 1 national project and 2 team websites at CERFACS).
- Other software and languages: LaTeX, latex2html, HeVeA, CVS, SVN, IGOR, Photoshop, Word, Excel, PowerPoint.

## Extra-professional activities

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Love reading, playing piano, interested in decoration and art exhibitions.  
Enjoy travelling, trekking and bicycle excursion.

## Publications

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- T. Poinso, **M. García**, J.-M. Senoner, L. Gicquel, G. Staffelbach and O. Vermorel. "Numerical and Physical Instabilities in Massively Parallel LEW of Reacting Flows". *Journal of Scientific Computing*, 49:78-93 (2011).
- F. Jaegle, J.-M. Senoner, **M. García**, C. Jiménez, B. Cuenot and T. Poinso. "Comparison of Euler-Euler and Euler-Lagrange methods for liquid jet injection in a crossflow". *Flow, Turbulence and Combustion*, (submitted, 2011).
- F. Jaegle, J.-M. Senoner, **M. García**, F. Bismes, R. Lecourt, B. Cuenot and T. Poinso, "Eulerian and Lagrangian spray simulations of an aeronautical multipoint injector", *Proc. Combust. Inst.* 33:2099–2107 (2011)
- N. Gourdain, L.Y.M. Gicquel, M. Montagnac, O. Vermorel, M. Gazaix, G. Staffelbach, **M. García**, J.-F. Boussuge and T. Poinso. "High performance parallel computing of flows in complex geometries: I. Methods". *Computational Science & Discovery* 2(november) 015003 (26pp) (2009).
- N. Gourdain, L.Y.M. Gicquel, M. Montagnac, O. Vermorel, M. Gazaix, G. Staffelbach, **M. García**, J.-F. Boussuge and T. Poinso. "High performance computing of industrial flows: Application to aeronautic and propulsion challenges – invited conference". In *VKI Lecture Series on High Performance Computing of Industrial Flows*, Von Kármán Institute, Brussels, Belgium (2009).
- F. Jaegle, J.-M. Senoner, **M. García**, C. Jiménez, B.Cuenot, and T. Poinso. "Evaluation of simulation strategies for multipoint injection systems in aero-engines on the example of a liquid jet in a gaseous crossflow". In *11<sup>th</sup> Triennial International Conference on Liquid Atomization and Spray Systems*, Paper Number 042, Vail, Colorado USA (2009).

- J.-M. Senoner, M. Sanjosé, T. Lederlin, F. Jaegle, **M. García**, E. Riber, B. Cuenot, L.Y.M. Gicquel, H. Pitsch and T. Poinso. “Eulerian and lagrangian large-eddy simulations of an evaporating two-phase flow”. *Comptes Rendus Mécanique*, **337(6-7)**, pp. 458-468 (2009).
- E. Riber, V. Moureau, **M. García**, T. Poinso and O. Simonin. “Evaluation of numerical strategies for LES of two-phase reacting flows”. *Journal of Computational Physics*, Vol. 228, N° 2, pp. 539-564 (2009). Preliminary article also with H. Pitsch in *Proceedings of the Summer Program 2006*. pp. 197-211.
- J.-M. Senoner, **M. García**, S. Mendez, G. Staffelbach, O. Vermorel and T. Poinso. “Growth of Rounding Errors and Repetitiveness of Large-Eddy Simulations”. *AIAA Journal*, Vol. 46, N° 7, pp. 1773-1781 (2008).
- **M. García**, E. Riber, O. Simonin and T. Poinso. “Comparison between Euler/Euler and Euler/Lagrange LES approaches for confined bluff-body gas-solid flow”. *Proceedings of the 6<sup>th</sup> International Conference on Multiphase Flow*, CD-Rom - S3\_Fri\_A\_62 - Leipzig, Germany (2007).
- **M. García**, Y. Sommerer, T. Schönfeld and T. Poinso. “Evaluation of Euler/Euler and Euler/Lagrange strategies for large-eddy simulations of turbulent reacting flows”. In *ECCOMAS Thematic Conference on Computational Combustion*. Lisbon, Portugal (2005).

## References

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